Consulting Assistance on Economic Reform II

DISCUSSION PAPERS

The objectives of the Consulting Assistance on Economic Reform (CAER II) project are to contribute to broad-based and sustainable economic growth and to improve the policy reform content of USAID assistance activities that aim to strengthen markets in recipient countries. Services are provided by the Harvard Institute for International Development (HIID) and its subcontractors. It is funded by the U.S. Agency for International Development, Bureau for Global Programs, Field Support and Research, Center for Economic Growth and Agricultural Development, Office of Emerging Markets through Contracts PCE-C-00-95-00015-00 and PCE-Q-00-95-00016-00. This paper is funded by Contract PCE-Q-00-95-00016-00, Delivery Order 15. Copyright 1999 by the President and Fellows of Harvard College.

Growth, Inequality, and Poverty Alleviation: Implications for Development Assistance

Mary Kay Gugerty
C. Peter Timmer

CAER II Discussion Paper 50
December 1999

The views and interpretations in these papers are those of the authors and should not be attributed to the Agency for International Development, the Harvard Institute for International Development, or CAER II subcontractors.

For information contact:
CAER II Project Office
Harvard Institute for International Development
14 Story Street
Cambridge, MA 02138 USA
Tel: (617) 495-9776; Fax: (617) 496-9951
Email: caer@hiid.harvard.edu

Growth, Inequality, and Poverty Alleviation: Implications for Development Assistance

Mary Kay Gugerty
Program on Political Economy and Government, Harvard University

C. Peter Timmer[1]
Dean and Professor of Development Studies,
School of International Relations and Pacific Studies,
University of California at San Diego

November 1999

Sponsored by the Office of Emerging Markets, Economic Growth and Agricultural Development Center, Bureau for Global Programs, Field Support and Research, U.S. Agency for International Development under the Consulting Assistance on Economic Reform (CAER) II Project (Contract PCE-Q-00-95-00016-00, Delivery Order No.15). The views and interpretations in this paper are those of the authors and should not be attributed to USAID.

This paper has benefited from comments and feedback from a number of individuals, most notably David Canning, John Gallup, Orest Koropecky, Steven Radelet, and Andrew Warner. Any remaining errors are the authors' alone.

[1] A section of this paper contains contributions by Andrew Warner.

Table of Contents

List of Tables

List of Figures

I. Introduction

The persistence of poverty in a world of economic growth has stimulated a long literature on the relationship between economic growth and poverty alleviation, much of it stemming from the influential theory of Simon Kuznets that inequality might rise in the initial stages of development. More recent literature has addressed the effects of initial income inequality on subsequent economic growth, but far less work has examined the particular effects of inequality and growth on the income of the poor and the connection of the poor to the growth process. Is the growth process somehow different in unequal societies and is this difference economic or political? The answers to these questions have large implications for the focus of economic development policy and the content of foreign assistance. The recent availability of longitudinal data on income distribution for a cross-section of countries has made such analysis feasible. Since 1997, the Consulting Assistance on Economic Reform (CAER) project at the Harvard Institute for International Development (HIID) has prepared a number of research papers for the United States Agency for International Development (USAID) addressing the relationship between economic growth and poverty alleviation.

The initial paper in this series (Roemer and Gugerty 1997) shows that the poor do tend to benefit on average from economic growth. For every 1 percent of overall per capita GDP growth, the poorest 20 percent of the population experienced a nearly 1 percent increase in their incomes. This implies that on average, economic growth will benefit the poorest 20 percent of the population as much as the richest 20 percent, at least in percentage terms. Subsequent work by Gallup, Radelet, and Warner (1998) confirms this average relationship and suggests an additional result: in those countries where the poor initially held a lower share of income, the subsequent growth in the income of the poor was higher.

The third paper in this series examines these same questions using a different analytic model (Timmer 1997). In this paper, Timmer estimates what he calls the 'elasticity of connection' between the poor and the rest of the economy. This elasticity is in essence the same parameter discussed in earlier papers: the extent to which the poor share in overall GDP growth. Instead of using regressions based on growth episodes, however, Timmer regresses the level of per capita GDP growth on the level of income for all five income quintiles simultaneously, using a fixed-effects framework. This model found that while the poor do participate in growth in many economies, the extent of that participation is much lower in more unequal countries.

In this paper we find that while the poor do benefit from growth on average, this average masks a great deal of variation and the poor are particularly disadvantaged in unequal countries. The question of interest for policy, however, is not the connection of the poor to economic growth *on average*. In some economies the income of the poor has grown faster than per capita GDP, and in others the poor have been left behind. The question of interest, then, is the role of policy and economic structure in both the

unsuccessful and successful economies. Economic structure and economic history affect the patterns of future growth, and the sectoral composition of growth affects poverty alleviation. In developing countries with highly unequal income and asset distribution—a product of both current and historical policies—the poor may be substantially disadvantaged in the growth process. The challenge is to understand the scope and limits of economic policy and development assistance in remedying this inequality.

This paper proceeds as follows: we first review the research completed to date, suggest some explanations for the various results, and review the recent literature on poverty alleviation, inequality, and growth. We then present a simple, stylized schematic model that discusses the links between income distribution and asset distribution. We conclude with a section outlining the major policy implications of recent research and laying out the research agenda for the future.

II. Participation of the Poor in Economic Growth

A. Economic Growth and Income Growth of the Poorest

The first paper in this series (Roemer and Gugerty 1997) uses data on income distribution covering twenty-six developing countries to compare the growth of average income for both the poorest 20 percent and the poorest 40 percent of the population to the growth of GDP per capita. The analysis shows that an increase in the rate of per capita GDP growth translates into a one-for-one increase in growth of average income of the poorest 40 percent. GDP growth of 10 percent per year is associated with income growth of 10 percent for the poorest 40 percent of the population. For the poorest 20 percent the elasticity of response is 0.921; GDP growth of 10 percent is associated with income growth of 9.21 percent. These regressions indicate that on average the poor do benefit substantially from economic growth. On average, the poor do better in countries that grow quickly, even if income distribution deteriorates slightly. Countries that experienced rapid economic growth over the last thirty years, such as Hong Kong, Korea, Malaysia, and Indonesia, saw the per capita incomes of the poorest 20 percent and 40 percent of the population grow significantly.

The second paper in this series, "Economic Growth and the Income of the Poor" (Gallup, Radelet, and Warner [hereafter GRW] 1998), extends the results of the first paper by looking at a wider sample of countries and a longer time period. GRW examine the relationship between economic growth and poverty through two models. The first model (the "short panel") uses the same essential framework as Gugerty and Roemer, but uses data from 69 countries that include 488 growth periods, with an average growth period of 2.7 years. The second model is a long-run growth model (the "long panel") that examines one long-term growth episode from the 1960s to the 1990s for 54 countries. In their short panel analysis,

GRW find that in a simple regression of the income growth of the poor against overall income growth, the "elasticity of connection" is nearly one. In addition, their analysis indicates that where the initial income share of the poor is low, the subsequent income growth of the poor is higher than average income growth. This suggests a tendency for countries to converge to similar income shares for the poorest quintile.

The paper next estimates the same regression using fixed-effects estimates, creating a model similar to that of Timmer (1997). This technique allows a separate intercept for each country in the sample, and attempts to control for country differences in income growth of the poor due to unobservable factors. Again they find that the elasticity of connection of the poor to GDP growth is one, and income growth of the poor is higher in countries with an initially lower income share of the poor. Their analysis also tests for the presence of measurement error as potential driver of the results. In the early years of the study, the income of the poor may have been badly estimated because of poor survey and data quality. If that is the case, then the first income estimate may be different than the actual income, implying that subsequent growth in income is misestimated. In attempting to correct for this problem using instrumental variables analysis, GRW find evidence of some measurement error in the data. Using the previous period's income share as an instrument reduces the impact of initial distribution to a statistically insignificant level, though the sign remains the same. GRW then turn to the analysis of longer-run effects, estimating the model over a growth period of thirty years. They find the results of the short panel confirmed over the longer term: growth of income of the poor is highly connected to overall income growth, and income growth of the poor is higher in countries with a lower initial share for the poor.

B. The Relative Income Gap and the Level of Income of the Poor

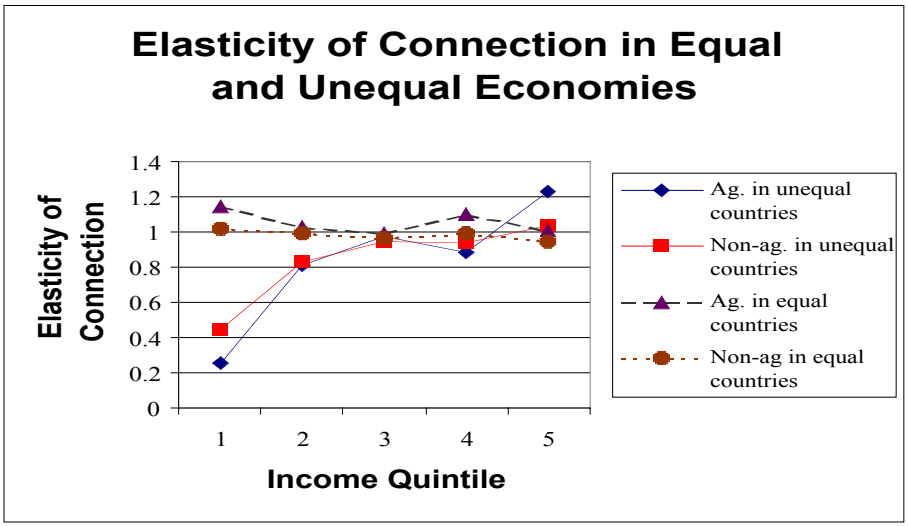
Timmer (1997) also examines the question of whether the poor share in economic growth. This is what Timmer calls the "elasticity of connection," or the degree to which a percentage increase in overall GDP translates into a percentage increase in the income of the poorest quintile. In addition, this paper addresses the question of whether the sectoral composition of growth matters for the incomes of the poor. The Timmer paper uses a different estimation strategy as well as a different sample of countries. To estimate the elasticity of connection, Timmer regresses the level of income of each quintile on overall per capita GDP. This levels estimation includes country- and time-fixed effects (dummy variables for each country included and for each decade from the 1960s to the 1990s). The country-fixed effects allow shifts in the regression intercept for each country, but assume the same slope, or elasticity of connection, for all countries. The fixed effects for decades allow a shift in the regression intercept for each decade. The paper also restricts the sample of countries examined. Because the paper also examines the sectoral composition of growth between agriculture and nonagriculture, the countries included are those that have a significant agriculture sector, are reasonably large, and are considered developing countries. For this

reason, countries such as Hong Kong and Singapore are excluded, as are most countries with populations smaller than 6 million (Costa Rica and Jamaica are the exceptions).

To examine the impacts of inequality on income levels of the poor, Timmer constructs a dummy variable that measures the relative income gap between the rich and the poor. This dummy variable is equal to one when the gap in income between the highest and lowest quintiles is more than twice as large as average income. Timmer then disaggregates income into sectoral components for agriculture and nonagriculture in order to examine whether the sectoral composition of labor productivity matters to the incomes earned by each quintile. Preliminary results from asking a similar question have already indicated that growth in the agricultural sector seems to have a much larger impact on growth of incomes in the bottom quintile than growth in services or industry (Ravallion and Datt 1996; Gallup, Radelet, and Warner 1997). The question here is framed in terms of relative labor productivities. Do the per capita labor productivities of workers in agriculture and nonagriculture have differential effects on the average earnings in each income quintile? Put another way, do the poor benefit more from growth in the agriculture or the nonagriculture sector?

Timmer finds that in unequal countries, there is a pronounced Kuznets effect. The elasticity of connection for the poorest quintile is significantly lower than for the higher quintiles: the poor appear to be much more disconnected from the growth process in these economies. The elasticity of connection for the poorest quintile is 0.257 for agriculture and 0.449 for nonagriculture. In contrast, for those economies with better income distribution, the elasticity of connection for the poor in the agriculture sector is 1.146 and 1.018 for nonagriculture. This is slightly higher than the elasticities for the upper quintiles, suggesting a slight "anti-Kuznets" effect in these economies. These results are illustrated in Figure 1 below.

Figure 1



Source: Timmer (1997)

Two fundamentally different growth processes seem to be at work with respect to the roles of labor productivity in agriculture and nonagriculture, and how these affect incomes in each of the five quintiles of the income distribution. In countries where the income gap is relatively small, labor productivity in agriculture is slightly but consistently more important in generating incomes in each of the five quintiles. Furthermore, agricultural productivity has a noticeable "anti-Kuznets" effect in these countries. A similar "anti-Kuznets" effect is seen from the nonagricultural sector and this impact is even more important to the poor because the nonagricultural sector makes up, on average, 75 percent of the overall economy. This sector also has the capacity to grow significantly faster than the agricultural economy over sustained periods of time. The contrast with countries where the relative income gap is large—more than twice the average per capita income—is striking. In the poorest quintile, workers are virtually disconnected from the national economy. A 95 percent confidence interval includes zero for both sectors. The elasticity of connection rises sharply by income class and exceeds one for the top quintile.

III. Reconciling Results from the Research[2]

A. The Basic Data and Specifications

The Roemer/Gugerty and GRW papers suggest that the poor benefit on average from growth; the latter paper also indicates that the incomes of the poor grow more rapidly in more unequal economies. Timmer suggests that even if the poor do benefit on average from growth, this average conceals a great deal of variation. The poor in more unequal countries do not participate as widely in growth. These results have differing implications for the content of economic policy and development assistance; understanding the sources of these differences is therefore crucial. The next section of the paper attempts to explain these differences. Appendix A gives greater details on the derivations and estimations discussed below.

Each paper regresses income of the poorest quintile on overall per capita income. If we run a regression of the log of the first quintile's income on the log of per capita GDP, we are estimating the following equation:

$$y^1_{it} = \alpha_0 + \beta_1 * y_{it} + \mu_{it}$$

In this equation, α_0 is the intercept term, β_1 is the elasticity of connection of the poor to the overall economy, y_{it} is the log of income of a given country in a particular year, and μ is the error term. The dependent variable, y^1_{it}, is the log per capita income of quintile one, the poorest quintile. The error term in

[2] The analysis in sections A through D and in Table 1, as well as in Tables 1 and 2 in Appendix A was performed by Andrew Warner, and written up by Andrew Warner and Mary Kay Gugerty. Further details are given in Warner (1999).

this equation (μ_{it}) includes variation in quintile per capita income that is not explained by the log of per capita income (y_{it}). This implies that the error term captures information in the data about income distribution. The estimate of the elasticity of connection (β) is in essence asking whether or not there is a relationship between y_{it} and $\mu_{it.}$ If the estimate of β is equal to one, this implies that there is no relationship between the two. In other words, if income distribution is not correlated with per capita GDP across countries and across time, then we would observe no covariance between y_{it} and μ_{it} and an estimated coefficient in the regression close to one. Therefore, regressions of the log level of GDP of the poor on the log level of GDP supply the same basic information as examining the correlation of income distribution and the level of GDP. If income distribution improved as GDP rose, we would observe a positive covariance between μ_{it} and y_{it} , and the estimate of β_1 would be greater than one.

When dummy variables for countries or for time are added to the regression above, the same questions are being asked but the variation in the data is now restricted to either time or cross-sectional variation. For example, Timmer (1997) estimates his regression with country dummies and decade dummies. He is therefore controlling for both decade-to-decade variation and variation between countries. This regression asks whether there is a correlation between GDP per quintile and income distribution over time within decades and within countries. Or put another way, for a given country and decade, is there correlation between quintile GDP and income distribution? Timmer finds that there is indeed a correlation in unequal countries, and as we will see below, this correlation for unequal countries holds whether or not the decade dummies are included.

B. Regressions on Levels versus Growth

Just as in the regression with levels, if we run a regression of growth of the income of the poor on growth of the whole economy, the error term is again essentially measuring income distribution. If the change in income distribution is uncorrelated with growth, then the estimated coefficient on growth of the income of the poorest will be one; if not, the estimated coefficient will be biased away from one. Asking whether the coefficient in such a regression is equal to one is equivalent to asking whether changes in inequality are correlated with changes in income (i.e. growth). If growth regressions are to be compared with regressions in levels, the best comparison is between a levels regression with a full set of country dummy variables and a growth regression without country dummy variables. Both regressions then focus on time variation. Differencing the data removes the country-specific effects in the growth regressions, while using country-fixed effects removes these effects in the regressions in levels. Nonetheless, the growth regressions are comparing relative trends, while the fixed-effects regression in levels is examining differences from means.

In the remainder of this section, we list a number of alternative ways to process the income distribution data and run the regressions, encompassing all the variants used by previous authors. We present many estimates of the elasticity of connection between incomes of certain quintiles and overall income. *On average,* the elasticity of connection of the income of the poor to average per capita GDP is not statistically different from one. Across all countries in our sample over the range of years for which data are available, income appears to be uncorrelated with income distribution, on average, no matter which countries are included in the sample. When we look at the differences between equal and unequal countries, however, we do find a relationship between income of the poor and distribution. And in this analysis, the sample used as well as the measure of inequality used both matter.

There are a number of different factors that could account for differences in the regression results. First, results could differ according to the number of years over which growth is calculated. Second, the results could differ because of the years of data included in the sample. For example, if earlier data (say, pre-1965) are included and there is higher measurement error associated with this data, then the results may look different than in regressions where only post-1965 data are included. Third, results may differ because the countries included in the sample differ. Finally, the method used to calculate rates of growth could affect the results. In section C we test these variations for regressions in growth and levels.

C. Comparing Results

1. Sensitivity Analysis for Growth Regressions

We first test the sensitivity of the growth regressions to using different time spans and different samples. The results are given in Table 1 of Appendix B. The estimates of the elasticity of connection are robust and are close to one in most cases. The 95 percent confidence interval includes one for all but one case. The standard error is higher when the sample is restricted to the Timmer sample, which is not surprising. We might expect greater measurement error in the developing country sample. In this growth regression format, neither altering the number of years over which growth is calculated nor changing the sample of countries used affects the basic result.

2. Sensitivity Analysis for Regressions in Levels

We now turn to the question of how the specification affects the results when the analysis is done in levels instead of in growth rates. Below we present estimates of the elasticity of connection for the first quintile. The regression run for these equations is:

$$y^1_{it} = \alpha_0 + \beta_1 * y_{it} + \text{country dummies} + \text{error term}$$

In this specification y^1_{it} is the log of income of the first quintile, α_0 is the intercept term, β_1 is the estimate of the elasticity of connection, and y_{it} is the log of per capita income. For these estimates we use the maximum number of observations that the data permits, no matter how short the interval, and we use all years for which data exist. Estimates of β are shown in Table 2 of Appendix B. We first estimate the elasticity of connection using the full sample, but exclude the decade dummies used in Timmer (1997). The estimates of the elasticity of connection do not differ statistically from one. We then restrict the sample to only those countries considered in the Timmer paper, but still exclude the decade dummies. While the estimate for the first quintile is slightly lower, the confidence interval still includes one. On average, then, the elasticity of connection is one for all specifications. The estimate for the elasticity of connection appears to be lower in the original Timmer specification due to the inclusion of decade dummy variables. According to the discussion above, this indicates a potential correlation between GDP and income distribution in a given country for a given decade.

If we conclude that, on average, income distribution does not greatly change with growth, and the poor therefore benefit from growth on average, we still have not addressed the question as to what lies behind the average. And indeed, there is a great deal of variation in the extent to which the poor participate in the growth process. In addition, while the poor benefit on average in percentage terms, the relative gap in incomes between the richest and poorest may nonetheless grow, and this may matter for a number of reasons, not the least of which is the political sustainability of the growth process. Are the poor more or less likely to benefit from growth in unequal countries? The rest of this section addresses that question.

D. Inequality and the Income of the Poor

When looking across the sample as a whole we found that, on average, the elasticity of connection is close to one. This result did not change whether we used the full sample or the more restricted developing-country sample from Timmer. When, however, we begin to look at whether the elasticity of connection is different in countries with a more unequal distribution of income, we find that sample restrictions may matter, as does the measure of inequality and the estimation technique that is used.

GRW, using a long-run growth regression framework, find that in countries where the initial income share of the poorest is lower, subsequent growth is higher. In other words, they find evidence for a "catch-up" phenomenon within countries with growth, producing an anti-Kuznets effect. They find this

effect holds both in the full sample and in a sample restricted only to developing countries. When they instrument for initial income share of the poorest quintile, however (using the previous period's income share), they find that the effect of initial income share on subsequent growth is not statistically significant. Timmer, using a smaller sample and a different measure of inequality, finds that in countries with a large gap in income between the top and bottom quintiles, the poor have a lower elasticity of connection to growth. Thus the poor do not appear to benefit as much from growth as do the rich in these economies.

We first run regressions in levels looking at the elasticity of connection for the first quintile. These regressions are run separately for high- and low-inequality countries and use both the full and more restricted developing-country sample. We obtain the estimates shown in Table 1 below. Country dummies are included in these regressions, but decade dummies are not. The Timmer definition of inequality is "RELGAP." Using this measure, a country is considered unequal if the difference in income held by the top quintile and the bottom quintile is more than twice as great as per capita GDP. The other measure of inequality used is the share of income held by the bottom quintile, or "q1." Countries where the share of income of the poorest 20 percent is less than 6 percent of total GDP are considered by this measure to be unequal (i.e., q1 < 6%).

Table 1
Estimates of the Elasticity of Connection in Quintile 1
Using Levels Regressions
(standard errors in parentheses)

	Sample Used	Elasticity Estimate
1	Full sample High inequality -RELGAP>2	0.85 (0.08)
2	Full sample Low inequality -RELGAP<2	1.016 (0.021)
3	Full sample High inequality -q1 share <6%	1.00 (0.052)
4	Full sample, Low inequality -q1 share >6%	.998 (0.021)
5	Timmer sample High inequality -RELGAP >2	0.76 (0.096)
6	Timmer sample Low inequality -RELGAP<2	1.027 (0.030)
7	Timmer sample High Inequality q1 share < 6%	0.99 (0.089)
8	Timmer sample Low inequality q1 share >6%	1.017 (0.029)

Interestingly, the use of the RELGAP measure of inequality seems to be having an effect on the results, and the use of this variable has stronger effects in the developing country sample. In the full sample, the

estimate of the elasticity of connection using the RELGAP measure is only 0.85, though the confidence interval just includes one. These results also support the results in the Timmer paper, indicating that the Timmer results for inequality are not solely driven by the decade dummies, which are not included here. In row five of the table, when the sample is restricted to the Timmer sample countries, the estimate of the elasticity of connection for unequal countries falls to 0.76.

E. The Measure of Inequality and the Sample Set

It appears that the definition of inequality may be one factor driving differences in results when regressions are done in levels. How do the RELGAP and quintile share measures differ in the table shown above? Looking at only the Timmer sample, the RELGAP measure of inequality switches countries from equal to unequal (or vice versa) for ten observations. Using the RELGAP measure in the full sample causes at least seventy-six observations to switch from being considered unequal to equal, and at least fourteen observations to switch from being equal to unequal. The vast majority of the countries making a switch in this sample are developed countries. Most of these countries are considered unequal if the standard used is the share of income of the poorest quintile. When the relative gap in incomes is considered, however, the United States and other developed countries have relatively equal distributions. The definition of inequality is a key factor driving the results in the table above. Clearly income share of the poorest 20 percent and the relative income gap capture different features of an economy; the analyst must decide which most accurately captures the pertinent characteristics of inequality.

Does the measure of inequality affect the outcomes in the original growth and levels regressions? Table 2 below shows the regression results in levels when q1 is used as the measure of inequality in the Timmer regressions. With the exception of column one, all model specifications include country, but not decade, fixed effects.

Table 2

Levels Regressions Results

Measure of Inequality	**RELGAP**	**RELGAP**	**RELGAP**	**Share of income of bottom quintile**	**Share of income of bottom quintile**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Sample Used	Timmer sample	Timmer sample, no decade dummies	Full sample	Timmer sample	Full sample
Elasticity of connection to agricultural GDP in equal countries	1.146 (.188)	1.156 (.184)	1.116 .112	1.194 (.162)	1.068 (.106)
Elasticity of connection to nonagricultural GDP in equal countries	1.02 (.111)	1.077 (.105)	1.007 (.069)	1.122 (.094)	.980 (.065)
RELGAP dummy	5.095 (1.45)	5.145 (1.36)	1.010 (.825)	4.620 (1.18)	-.045 (.784)
RELGAP * agricultural output	-.9004 (.242)	-.912 (.238)	-.252 (.145)	-.839 (.203)	-.094 (.137)
RELGAP * nonagricultural output	-.575 (.149)	-.576 (.142)	-.131 (.086)	-.541 (.126)	-.0208 (.081)
Elasticity of connection to agricultural GDP in unequal countries	.257	.244	.864	.355	.974
Elasticity of connection to nonagricultural GDP in unequal countries	.449	.501	.876	.581	.9592

The first point to note from this table is that again, the Timmer results are not much affected by the inclusion of the decade dummies: the results in columns one and two are quite similar. The use of q1 (column four) versus RELGAP (columns one and two) does not change the results when using the Timmer sample of developing countries. The measure of inequality also does not affect the results in the full sample (columns three and five). The sample used, however, does affect the estimates of the elasticity of connection. When only developing countries are included, as in columns one, two, and four, the estimates of the elasticity of connection in unequal countries are strikingly lower. This suggests that the important distinction for policy is not the differences in inequality between developed and undeveloped countries, but the differences in inequality among developing countries.

When the GRW growth regressions are run in the full sample using the initial RELGAP instead of the initial share, the direction of influence remains the same as when using the initial quintile share of income, but the results are not statistically significant. This remains true when the sample is restricted to the Timmer set of developing countries. When the sample is divided into unequal and equal countries, however, the results change. The elasticity of connection is lower in unequal countries, and this is true whether the measure of inequality is the initial income share or RELGAP.

Table 3 summarizes the results of the various specifications we tested and indicates the direction of the estimated effect of inequality on the income of the poor. The "+" sign indicates that inequality has a positive effect on income of the poorest, while the "-" sign indicates that inequality has a negative effect on the income of the poorest. Table 3 in Appendix B gives a fuller report of the coefficients in these regressions.

Table 3
Effect of Inequality on Income of the Poor in Different Specifications

Sample and Measure of inequality	Growth regressions, inequality measure included	Levels regressions	Growth regressions	Levels regressions
	Inequality measure included in regression		Regressions run separately for high and low inequality countries	
Full sample, inequality=q1	+ (not significant)	-	- (weak)	no effect
Full sample, inequality=RELGAP	+ (not significant)	+ (not significant)	- (weak)	- (weak)
Timmer sample, inequality=q1	+	-	- (weak)	no effect
Timmer sample, inequality=RELGAP	+ (not significant)	-	-	-

"Not significant" indicates that the coefficient on the inequality is not significant at the 5 percent level.
"Weak" indicates that although the coefficient estimates differ, the confidence intervals show significant overlap.

In all the growth regressions, inequality positively affects subsequent income growth of the poorest. These results do not hold, however, when these regressions are run separately for high- and low-inequality countries. The majority of the levels regressions indicate a negative relationship between inequality and the level of income of the poor. Easterly (1997) obtains similar results when comparing estimators based on differences, and levels with fixed effects. At this point, it seems fair to conclude that the differences in the results on inequality are affected by the measure of inequality chosen and the sample used. But the results also depend on the estimation method used (growth regressions versus levels).

What are the advantages and disadvantages of each method? And what does other research say? A major feature of the growth regression specification is that the growth data have been "differenced." As discussed above, this removes the country-specific effects. Working in first differences, however, introduces another problem. The regression framework assumes that the dependent variable (in our case

the growth in income of the poor) is measured with error, and this variance is captured in the error term of the equation. It is also assumed that the variance in the independent (or explanatory) variables is not correlated, and that these variances are not correlated with the error term of the regression. We know that in practice this is rarely the case, and there are a number of econometric techniques available to deal with this problem, including instrumental variable estimation. When explanatory variables are measured with error (often called "errors in variables"), however, the problem is more severe. The measurement error now appears both in the variable and in the error term of the regression; OLS regression estimates are therefore biased. If the extent and direction of the measurement bias is known, this problem can be partially corrected, but in practice this is information is rarely known.

Another issue arises in using the initial share of income as a measure of inequality. This income share may be measured with a great deal of error in early years. In this case the regression may be capturing regression to the mean as later observations are measured with greater precision. This is particularly true if early measurement tended to poorly estimate the income of the poor. GRW address this issue by instrumenting the initial income share with the previous period's income share. This reduces the size of the coefficient and its statistical significance, suggesting that measurement error is at work. Instrumenting with the previous period's income share may also present problems, however, as the previous period's share is likely to be both correlated with subsequent periods and also measured with error. It is therefore difficult to tell whether the coefficient on the initial income share variable reflects genuine convergence in distribution across countries, or a regression to the mean. As is discussed below, there is no consensus in the empirical literature on this point. We also note that the effects of inequality look quite different when the growth regressions are run separately for high- and low-income countries.

The estimation in levels somewhat avoids this measurement error problem, but there are other difficulties. Time series data in levels are not likely to be stationary. A data series is stationary if the mean of the variable does not vary with time. Clearly with time series data such as GDP this is not the case, as we would expect a clear time trend in the data. Where data are nonstationary, it is possible that t-statistics will be misleading. Once the data are differenced, as in a growth regression, the stationarity problem is reduced because the regression is done on changes in levels rather than on a single level. This is not the case when working with time series data in levels, however, and so one should be somewhat cautious in interpreting t-statistics in this kind of data. Using country-fixed effects in a time series regression, however, allows a different intercept for each country examined. This implies that the regression is explaining differences between the means of the countries, so that the stationarity of the variables is less of a problem. The inclusion of decade dummies also has the effect of removing some of the time trend.

Another difficulty stems from the fact that the data are not annual. The years for which data are available vary across countries; therefore many of the standard methods for correcting econometric errors

cannot be applied. When using panel data, there is a possibility of two kinds of problems. First, errors might be correlated within countries, and second, errors might be correlated across the quintiles; correcting these errors, if they exist, would increase the standard error of the coefficient estimates, thereby reducing the statistical significance of the estimates. Because the data are not evenly spaced, however, the standard corrections cannot be used.

So which is the correct approach? There is a wide literature using both approaches. The cross-country growth literature has used the growth framework, other literature (most notably work by Ravallion and Datt) has used a time series framework. As noted above, each statistical framework has its disadvantages and there is no consensus in the literature about the "correct" technique. What we can do at this point is note the direction of bias caused by the estimation technique. In the growth framework, the errors-in-variables problem may mean that the coefficient on the initial share of inequality is artificially high and may overstate the effects of initial inequality on the subsequent growth in income of the poor. In the levels framework, the inability to correct for correlations among errors means that the standard error around the coefficients is higher than estimated. Thus while the coefficient estimates are unbiased, the confidence interval around them is probably understated. This may not be a large problem in the Timmer specification, given the large t-statistics.

This ambiguity is of little comfort to policymakers who must design strategy in the face of uncertainty. We would argue, however, that the important policy question is not whether or not economic growth is "good" for poverty alleviation. The incomes of the poor will not increase without economic growth, and in many countries the poor benefit as much as the rich from economic growth. Given the ability of some countries to make tremendous strides in poverty reduction and the persistence of poverty in other countries, the questions of interest are the following. What are the constraints to growth of the incomes of the poor (particularly in unequal societies), and how can policy loosen those constraints so that the economic growth is "pro-poor?" We therefore turn to other research in this area, in order to present a fuller picture of the current thinking on this relationship. We also introduce the idea of asset inequality as at least one underlying mechanism driving the relationship between inequality and poverty.

IV. The Research on Income and Asset Distribution and Poverty

It is virtually impossible to understand the impact of economic growth on income distribution and of income distribution on the rate and distribution of economic growth without incorporating the distribution of assets held by the society. Assets are important because they are a measure of the capital available to an individual or society for the production of goods and services. Assets are likely to be distributed even more unequally than income. In a world of perfect data, one would rather examine the distribution of assets than income, but in reality, data on the distribution of assets are almost nonexistent,

particularly for developing countries. We therefore begin with a very brief review of the theoretical and empirical work on the relationship between asset distribution and poverty. We then present a simple, stylized model of asset accumulation.

Theoretical work in economics has suggested that the distribution of wealth can have important long-term effects on economic growth (Galor and Zeira 1993; Bannerjee and Newman 1993; Benabou 1997). The main mechanisms causing the persistence of inequality are thought to be credit rationing, wealth transfers through inheritance, and the intergenerational transmission of ability, preferences, and tastes. Where credit markets are imperfect, and investments (such as those in human capital) are indivisible, the poor are disadvantaged in the growth process. Lacking access to collateral for loans, the poor are unable to borrow to finance human capital or investments or any other capital accumulation. This may further skew the distribution of both income and assets. In addition, inequality can be perpetuated through inheritance (Piketty 1998), suggesting that wealth inequality and its effects on intergenerational mobility can persist in the long run. Piketty also notes that the main component of intergenerational welfare is the persistent inequality of labor earnings. Part of this persistence may be due to inefficiencies in the credit market, as described above. These inefficiencies and credit constraints may also vary greatly both among countries and over time. In addition, some analysts have suggested that unequal access to rent-seeking opportunities may reinforce income inequality (Piketty 1995). If the poorer individuals in a society perceive that opportunities for advance are limited by rent-seeking, there may be greater pressure for redistributive policies, and therefore more instability, lower investment, and lower growth. In addition, lower perceived mobility may discourage effort, thereby keeping incomes of the poor low, and causing income inequality to persist. Although the empirical data are quite limited, there is increasing evidence that inequality—particularly in the distribution of assets—has a negative impact on economic growth for the poorest members of a society.

A. Empirical Evidence on Inequality and the Income of the Poor

What does the limited empirical evidence say? Deininger and Squire (1998) find that initial income inequality and initial land inequality both have negative impacts on the incomes of the poor, but not on the rich. Using the initial distribution of land as a proxy for the distribution of assets, they find that asset inequality has a significant negative effect on subsequent growth, and this effect is stronger in low-income countries than in high-income countries. In addition, initial land inequality has a negative effect on rates of schooling, suggesting that the link between inequality and growth for the poor is mediated through credit rationing; the poor are unable to borrow to make investments in human capital.

Birdsall and Londono (1997) also examine the impacts of asset inequality on the income of the poor using the Deininger and Squire data. They find that inequality in the distribution of land and

education negatively impacts income growth of the poor. Datt and Ravallion (1998) examine the effects of inequality on the elasticity of poverty reduction in India using a model (similar to C.P. Timmer 1997) in which they condition out interstate differences in the level of poverty by including state fixed effects. In addition, they include state-specific time trends. They find that higher average farm yields, nonfarm output, and per capita state expenditure are all poverty reducing. The elasticity of poverty reduction for all these variables, except nonfarm output, does not vary across states. Nonfarm output, however, has quite different poverty-reducing effects in different states. Poverty responds in greater measure to nonfarm output where

1) farm yields are initially higher;

2) the level of urbanization is higher;

3) female literacy is higher (though the result is no different if overall literacy is used); and

4) inequality (as measured by the urban–rural consumption gap) is lower.

They conclude that "[c]ertain inequalities can severely impede the prospects for poverty reduction through nonfarm growth. . . Initial intersectoral disparities in earnings. . . influence how much nonfarm economic growth reduces the incidence of poverty. In addition, the higher the initial poverty rate, the less effective is nonfarm economic growth in reducing poverty." Nonfarm productivity is less effective in poverty alleviation in states with "poor" initial conditions.

B. Income Distribution and the Sectoral Composition of Growth

Timmer (1997) shows that in a sample of twenty-seven developing countries the per capita productivities of workers in agriculture and nonagriculture have differential effects on the earnings in each income quintile. The poor in unequal countries are effectively cut off from both the agricultural and nonagricultural sectors. In countries with more egalitarian distributions of income, the poor tend to benefit from growth in both agricultural and nonagricultural sectors, with agriculture contributing somewhat more strongly to this growth.

A growing body of research supports this result. Ravallion and Datt (1996) have shown that the sectoral composition of growth matters to poverty reduction in India: poverty measures in India have responded far more to rural economic growth than urban economic growth. In addition, their work indicates that the connection of the poor to rural economic growth is quite robust over time, at least in India. Recent research by Bourguignon and Morrisson (1998) also indicates that international differences in income distribution can be at least partially explained by land per capita, the share of land cultivated by

small- and medium-sized farmers, and the relative productivity differential between agriculture and the rest of the economy.

Both theoretical and empirical work, then, suggest that inequalities may persist over time, and that certain inequalities particularly penalize the poor. The next step in the research agenda is to better understand the underlying distribution of wealth in an economy and its implications for the economic and political sustainability of growth. There is virtually no data available on asset distribution in developing economies; we therefore use the Deininger and Squire data on income distribution to develop a simple, stylized model of asset distribution and its evolution over time.

C. A Simple Model of Asset Distribution

The purpose of this section is to explore the interaction of income and asset distribution. The difficulty, of course, is the lack of data on asset holdings by income class for almost any country in the world, much less the developing countries of concern in this paper. We utilize the Deininger-Squire (1996) data set on income distribution as a base from which insights on asset distributions can be inferred. For the analysis here, capital assets are divided into four categories: physical labor, human capital, financial capital, and social capital. We then make some simple assumptions about the returns to these various forms of capital to generate several striking lessons, along with guidelines for the next round of empirical research on the topic.

Physical labor is what an individual can exert without using any other form of capital to raise productivity. Somewhat arbitrarily, this physical labor is valued at $365 per year in terms of purchasing power parity (PPP), which is simply the World Bank's poverty line. If a worker's income depends entirely on competing with a horse, tractor, or bulldozer, the expected income is likely to be low indeed. Incomes below $365 per year reflect significant poverty and the likely depletion of human capital in the form of health and nutritional status.

Human capital comes from education and on-the-job training (in addition to physiological contributions from health and nutrition). It is useful to consider three categories of human capital: (a) that arising from literacy and numeracy, both of which should result from a primary education; (b) more formal analytical and reasoning skills that result from a high school education; and (c) advanced professional skills and research training that come from college and postgraduate education.

Again, somewhat arbitrarily, primary education in a developing country is assumed to generate $1,000 per year (in $PPP) for the holder, whereas finishing high school results in an additional $5,000 per year in earnings. Thus, by assumption, a worker with a completed high school education, or the equivalent in on-the-job training, is expected to earn $6,365 per year ($365 for physical labor returns, $1,000 for primary school returns, and $5,000 for high school returns). This simple assumption about

returns to human capital will have powerful implications for the distribution of assets, including financial assets. Because earnings from college and postgraduate education vary so widely, and are often seen as a return on financial investment, they are included in the financial category.

The third form of capital is the financial capital that permits ownership of land, industrial plant and equipment, and other financial assets. This category, of course, is what most people think of as "assets," and determining their distribution has bedeviled both theorists and empiricists for decades. A simple example of an age-old controversy in economics is whether capital assets should be valued at what they cost minus depreciation, or at market value as determined by the discounted flow of income. The market value approach has the obvious merit of putting all assets on a similar valuation basis, and of linking directly income flows with asset values. The disadvantage is the near tautology implied between incomes and asset values. The link can be altered only when the discount rate changes.

The empirical work reported here does not break down financial capital into more workable components, especially land, industrial capital, and financial assets, because this whole category of capital does not become important to income generation until well into the development process. Lack of access to land or industrial jobs will obviously reduce the earnings of the poor with no other capital at their disposal. But the surprising fact is that variations in human capital seem able to account for most of the differences in income distribution among poor countries, as will be seen shortly. But first a fourth form of capital needs should be included for completeness because it seems to account for a large proportion of the differences in productivity between poor and rich countries.

Social capital has taken the economic development profession by storm. By various measures, it seems to account for order-of-magnitude differences in incomes among individuals in African villages (Narayan and Pritchett 1999) as well as similarly large differences in incomes among countries (Knack 1999). The social networks, institutional infrastructure, and level of trust among economic agents that might account for these differences in productivity are the subject of major research efforts. Without a consensus yet on how to define social capital or attribute productivity differences to it, this paper merely observes that there are likely to be at least two different levels at which social capital operates, with substantially different policy implications.

First, social capital seems to exist at the micro level, connecting individual villagers whose knowledge of each other can be turned into collateral for loans, for example. At the other end of the spectrum, social capital in the form of deeply rooted institutions that support property rights and rule by law also seem to have macro-level implications for productivity and economic growth. It does not seem outlandish to suggest that societies with a full "portfolio" of social capital might have labor productivity that is twice as high as in a similar society with serious shortfalls in social capital. No effort is made to measure this potential empirically in this paper, although the research opportunities are obvious.

Building on the earlier analytical and empirical work in Timmer (1997), it is possible to use the above definitions and returns to capital to extend the data on income distribution reported in Deininger and Squire (1996). We use the assumptions given above to generate the numbers in Table 4, which provide results for six different countries representing a spectrum of poor- and middle-income countries with low, average, and high income gaps between the rich and poor in their societies. This gap (RELGAP) is the same variable used in the earlier paper to rank countries by the size of the gap between the per capita income of the top quintile and the bottom quintile, in relation to the average per capita income for the country. When this relative gap was greater than two, future economic growth seemed to be jeopardized by a combination of economic and political factors (A. Timmer 1998). RELGAP is used in this paper to chose representative countries for analysis of the links between income distribution and the distribution of assets.

The per capita quintile incomes shown are calculated by using the Deininger and Squire data set on income distribution and the Summers-Heston GDP data. To calculate the human capital by quintile, we take the level of income and subtract $365 (the returns to physical labor). Assuming a 5 percent rate of return on the investment in human capital, we divide the difference by 0.05 to arrive at the figure given in the human capital column. The countries and time periods shown in Table 4 capture two different dimensions of the relationship between income distribution and asset distribution. First is a distinction between patterns in very poor countries—China in 1980, Indonesia in 1978, and the Philippines in 1961—and countries well on the way to middle income status—Taiwan in 1979, South Korea in 1985, and Thailand in 1992. The poor countries in Table 4 have an average per capita income of $1083 in PPP terms. The average for the better-off countries is $4130, nearly four times as large. Second, whatever the income level, countries with more equal distributions of income have very different patterns of asset distribution, at least within the first four quintiles.

Table 4 illustrates some well-known features of the development process, and some features that are surprising. First, there can be astonishing differences in per capita income by quintile even when countries have the same average per capita income. Averages hide a lot. For example, the bottom income quintile in Indonesia in 1978 has almost the same income as the second quintile in the Philippines in 1961, even though both countries had the same average per capita income. By contrast, the top quintile in the Philippines had a per capita income nearly twice as high as the income in the top quintile in China in 1980. Thus the Philippines had both the richest and poorest citizens of these three countries at that stage in their development.

Table 4
Income and Asset Distribution

Country and Year	RELGAP	Average Per Capita Income	Quintile	Per Capita Income by Quintile	Human Capital by Quintile	Financial Capital by Quintile
		($PPP)		(PPP)	($000)	($000)
China, 1980	1.437 (low)	$971	I	384	0.38	0
			II	597	4.64	0
			III	893	10.56	0
			IV	1199	16.68	0
			V	1782	28.34	0
Indonesia, 1978	1.866 (average)	$1124	I	450	1.70	0
			II	568	4.06	0
			III	832	9.34	0
			IV	1225	17.20	0
			V	2546	43.62	0
Philippines, 1961	2.615 (high)	$1153	I	242	0	0
			II	455	1.80	0
			III	698	6.66	0
			IV	1113	14.96	0
			V	3257	57.84	0
Taiwan, 1979	1.399 (low)	$4249	I	1870	30.10	0
			II	2953	51.76	0
			III	3760	67.90	0
			IV	4844	89.58	0
			V	7818	120.00	29.06
S. Korea, 1985	1.755 (average)	$4217	I	1434	21.38	0
			II	2889	50.48	0
			III	3374	60.18	0
			IV	4554	83.78	0
			V	8835	120.00	49.40
Thailand, 1992	2.740 (high)	$3924	I	726	7.22	0
			II	1491	22.52	0
			III	2276	38.22	0
			IV	3649	65.68	0
			V	11478	120.00	102.26

Second, when countries are very poor, ownership of financial capital does not show up at the level of quintile averages. Obviously, in all three countries there would be a small group of individuals that owned substantial wealth, whether in agricultural land or industrial holdings. But the numbers are so small that they do not appear in the quintile figures. Instead, all of the differences in income distribution at this level of disaggregation are accounted for by the posited returns to human capital. In all three countries, the level of human capital in the bottom quintile is minuscule—even zero (or less than zero, implying a

depletion of human capital) in the Philippines. But even the incomes of the top quintiles in all three countries are easily accounted for by the modest returns assumed for human capital. Again, there would be another story if the disaggregation could be carried to the upper 5 percent or 1 percent, but no data are available for such an investigation.

Third, even in the three richer countries, differences in incomes of the bottom four quintiles are still accounted for by the assumed returns to human capital. Only in the fifth quintile, in all three countries, are the incomes high enough to exhaust those returns, thus requiring some return from financial capital to explain the incomes earned. The values for financial capital shown for the fifth quintile of these three countries are calculated by subtracting $6,365 from the income reported, and dividing the remainder by 0.05, the assumed real rate of return on such assets. Obviously, this rate of return can vary by country and year, but it is useful to use the same value for all the calculations in order to compare the results. Especially when the value of financial capital begins to be large enough to earn a substantial fraction of the total income generated in a society, such cross-country comparisons are interesting indeed.

Table 5 shows such comparisons for Thailand and Brazil over a three-decade period.

Table 5
Changes in Income and Asset Distributions

Quintile	Per Capita Income ($PPP)			Per Capita Human Capital ($000)		Per Capita Financial Capital ($000)	
Thailand, 1962–1992			**Annual Per Capita**				
	1962	**1992**	**Quintile Growth**	**1962**	**1992**	**1962**	**1992**
I	397	726	2.03%	0.64	7.22	0	0
II	427	1491		1.24	22.52	0	0
III	600	2276		4.70	38.22	0	0
IV	1066	3649		14.02	65.68	0	0
V	2470	11478	5.25%	42.10	120.00	0	102.26
RELGAP	2.089	2.740		3.470	2.431		
Brazil, 1960–1989			**Annual Per Capita**				
	1960	**1989**	**Quintile Growth**	**1960**	**1989**	**1960**	**1989**
I	285	534	2.19%	0	3.38	0	0
II	614	1047		4.98	13.64	0	0
III	970	1965		12.10	32.00	0	0
IV	1700	3909		26.70	70.88	0	0
V	5331	13927	3.37%	99.32	120.00	0	151.24
RELGAP	2.835	3.135		3.306	2.223		

Both Brazil and Thailand grew fairly rapidly during this three-decade period—Brazil from a per capita income of $1780 in 1960 to $4272 in 1989 (3.06 percent annual growth); Thailand from $992 in 1962 to $3924 in 1992 (4.69 percent annual growth). Income distribution in both countries, as measured by RELGAP, worsened from an average level of 2.089 in Thailand at the start to a highly unequal level of 2.740 at the end. In Brazil, inequality was already very high at the start of the period, and worsened to a level of 3.135 at the end, one of the worst distributions of income in the entire Deininger-Squire sample.

Not surprisingly, asset distributions in both countries also changed quite significantly, but not always in the expected direction. Levels of human capital increased dramatically for all income classes, but much faster for the poor than for the rich, who were already closer to the plateau levels used in this analysis. Increases of two to three times were the norm in Brazil; full order of magnitude increases occurred in Thailand. Even as income distribution worsened, the distribution of human capital became more equal, as the poor were finally included in the growth process to some extent. This result is supported by empirical research (Easterly 1997) that indicates that changes in primary school enrollment are strongly and positively associated with growth in lower income countries. Because of the self-limiting nature of human capital accumulation, however, this dimension of asset distribution is also limited in its potential contribution to future earnings. In addition, given the limits to the potential for investment in human capital suggested by the theoretic literature, it is clear that government policy will play an important role in human capital accumulation at lower levels of development.

The open-ended nature of financial assets avoids these limits. If the distribution of financial assets is or becomes highly skewed during the growth process, a country's income-earning potential at some point will lead to a self-reinforcing skewing of incomes. Both Brazil and Thailand seem to have reached such a point by around 1990. In Brazil, a simple dynamic calculation shows that if all incomes above the human capital level of $6365 are saved and invested in financial assets that earn the assumed 5 percent per year, within a decade the upper quintile of income earners will receive the entire income generated by an economy growing at 5 percent per capita per year. The general equilibrium mechanisms that bring about such a result presumably would work through changes in real wages and earnings accruing to human capital, because financial capital returns would be determined by the global economy. But the result is in no way unrealistic. Real after-tax incomes of the bottom 60 percent of households in the United States actually fell between 1977 and 1999, at the same time that incomes in the upper quintile rose by nearly 40 percent (and incomes in the upper 1 percent of households more than doubled). At some point in the development process, concentration of ownership of financial assets will lead to sharply skewed income distribution as an inevitable result of economic growth— a result that is not typically seen in the early stages of growth when the dependence on investments in human capital are far more important for the distribution of income.

Of course, these investments in human capital must actually be made for such a fortuitous result, and that is the clear policy message. For "growth with equity," a country must invest in the human capital of its poorest citizens. At the earliest stages this will involve primary health clinics, household food security, and access to rural schools. Policies that encourage the efficient functioning of rural financial markets can also play a role in increasing the poor's access to capital. Later, achieving "growth with equity" will mean providing opportunities for high school education and for on-the-job training for unskilled and semi-skilled labor. Such investments, if broad-based and of adequate quality, will keep the distribution of income from becoming highly skewed until well into the development process. Taiwan and South Korea managed such investments until middle-income status; Brazil, the Philippines, and Thailand did not.

An optimistic policy interpretation of these results is that fiscally manageable investment strategies are available for even the poorest countries to set themselves on an equitable growth path. The pessimistic interpretation suggests that political forces will keep this from happening where the "starting point" in income and asset distribution already prevents the poor from connecting to the growth process. But surely this is a result that the donor community can grasp—it provides this community with a rationale for investing in the very people that countries' leaders themselves might choose, or be forced, to ignore. Then the policy dialogue, and the resources that could be mobilized behind it, can have dramatic effects.

D. Conclusions and Policy Implications

There is little question that the poor are generally better off if an economy grows than if it does not. While the poor do benefit from growth on average, this average masks a great deal of variation. The question of interest for policy is not the connection of the poor to economic growth *on average*. In some economies the income of the poor has grown faster than per capita GDP, and in others the poor have been left behind. The question of interest, then, is to understand the role of policy and economic structure in both the unsuccessful and successful economies. Gallup et al. suggest that policy does indeed matter for income growth of the poor. Openness to the world economy, a positive government savings rate, and political stability are all associated with higher income growth for the poor. Our results support these findings, which are also consistent with recent literature on growth. But we also contend that economic structure and economic history matter, as well as the sectoral composition of growth. In developing countries with highly unequal income and asset distribution—a product of both current and historical policies—the poor may be substantially disadvantaged in the growth process. The challenge is to understand the scope and limits of economic policy and development assistance in remedying this inequality.

The data on asset distribution are notoriously weak and unreliable; a firm empirical base for understanding these questions is therefore not yet possible. But there are strong indications from a growing body of literature that both inequality and the sectoral composition of growth matter greatly for the poor. Below we distill some of the lessons of this recent research and our own work for development assistance.

1. Policy lessons for developing countries should be taken from other developing countries.

The sample set matters for drawing appropriate lessons from development experience. The research discussed here demonstrates that the relationship between inequality and growth may differ between wealthier and poorer nations. The growth process in the United States or Western Europe may be fundamentally different than the growth process in developing countries. Technologically advanced countries with a rich set of growth-supporting institutions face very different problems than poor countries with weak institutions and less-developed technologies. Even among the currently rich countries, the French experience of development and industrialization was sharply different from the British. Germany's experience was different from Japan's. Among poor countries, India is likely to look different from China, and even Kenya from Tanzania.

2. The method used to measure inequality matters.

The traditional measure of inequality, the Gini coefficient, is limited in its ability to capture changes in income distribution among income quintiles. A measure such as the share of income accruing to the poorest 20 percent does not capture the gap in income between the poor, middle class, and rich. If income distribution affects the sustainability of growth through both economic *and* political mechanisms, income inequality should be measured in a way that captures the relative as well as absolute poverty in a society. The research presented here indicates that using the relative income gap in a society to measure inequality in a society has different implications from other measures. For a given society, how the poor perceive their position relative to the rich in that society may matter more than their absolute consumption level, or even changes in that level. The poor in Indonesia experienced income growth above the national average from 1970 to 1995, yet the Jakarta newspapers were filled with stories of the growing income gap between rich and poor that were also true.

3. The distribution of income and assets matter.

A growing body of research suggests that income and asset inequality have a negative effect on the income growth of the poorest members of a society. The mechanism by which this inequality works,

however, will differ from country to country, and investigating this mechanism should be the next item on the research agenda. Theory and experience both suggest that asset distribution matters more than income distribution, as the poor are effectively prevented from borrowing to make investments, particularly in human capital. The simple model presented here indicates that a pro-poor development policy that encourages investment in the human capital of the poorest groups can have a large payoff in terms of improving the position of the poorest members of a society.

4. The sectoral composition of growth matters.

Timmer (1997) shows that in a sample of twenty-seven developing countries the per capita productivities of workers in agriculture and nonagriculture have differential effects on the earnings in each income quintile. The poor in unequal countries are effectively cut off from both the agricultural and nonagricultural sectors. In countries with more egalitarian distributions of income, the poor tend to benefit from growth in both agricultural and nonagricultural sectors, with agriculture contributing somewhat more strongly to this growth.

A growing body of research supports this result. Datt and Ravallion have shown that the sectoral composition of growth matters to poverty reduction in India: poverty measures in India have responded far more to rural economic growth than urban economic growth. Recent research by Bourguignon and Morrisson indicates that international differences in income distribution can be at least partially explained by land per capita, the share of land cultivated on small and medium-sized farms, and the relative productivity differential between agriculture and the rest of the economy. Finally, Ravallion and Datt also find that in India, states with lower urban–rural disparities in consumption levels, higher initial farm yields, higher female literacy rates, and higher urbanization rates, the elasticity of poverty (the reduction in poverty in response to GDP growth) is higher.

5. Development assistance should be based on country specific strategies.

Countries are unique because their histories are unique. There is widespread agreement in the economics literature on the set of macroeconomic policies and institutions that are essential in promoting growth. Yet a strong focus on cross-national analysis can obscure the fact that each country has a unique development experience and a specific set of institutions, political history and culture, and social structure. As USAID's "Strategies for Sustainable Development" emphasizes, good development assistance will be based on country-specific strategies that understand and address the specific barriers to growth facing the poor in a particular country.

6. Multilateral donors need to invest in their own human capital and capacity as well as in human capital and capacity in countries receiving assistance.

Broad-based economic growth requires top-level government commitment and competence as well as an effective and equitable development strategy. Designing an effective country-specific assistance strategy requires a depth of understanding and analysis that is not easy to achieve. Such a strategy requires multilateral staff who are resident in the country, and who have the experience and training necessary to formulate a strategy that is relevant, practical, and feasible. Implementation of such a strategy requires host-country counterparts who are equally capable of understanding and contributing to such a strategy. Promoting markets and market participation at the local level is important, but it will be far less effective in promoting broad-based growth without a national policy designed to support it and the foreign assistance targeted on the key obstacles to participation by the poor.

References

Alesina, Alberto, and Dani Rodrik. 1994. "Distributive Politics and Economic Growth." *The Quarterly Journal of Economics* (May).

Alesina, Alberto, and Roberto Perotti. 1993. "Income Distribution, Political Instability, and Investment." National Bureau of Economic Research (NBER) Working Paper No. 4486 (October). Cambridge, MA.

Anand, Sudhir, and S. M. R. Kanbur. 1993. "The Kuznets Process and the Inequality-Development Relationship." *Journal of Development Economics* 40(1): 25–52.

Bannerjee, A., and A. Newman. 1993. "Occupational Choice and the Process of Development." *Journal of Political Economy* 101.

Barro, Robert J., and Xavier Sala-i-Martin. 1995. *Economic Growth*. New York: McGraw-Hill.

Benabou, Rolad. 1997. "Inequality and Growth." In *NBER Macroeconomics Annual*, edited by Bernanke, B., and J. Rotemberg. Cambridge, MA: The MIT Press.

Birdsall, Nancy, David Ross, and Richard Sabot. 1995. "Inequality and Growth Reconsidered: Lessons from East Asia." World Bank Economic Review 9(3): 477–508.

Birdsall, Nancy, and Juan Luis Londano. 1997. "Asset Inequality Matters: An Assessment of the World Bank's Approach to Poverty Reduction." *American Economic Review* 97(2).

Bourguignon, F., and C. Morrisson. 1998. *Journal of Development Economics* 57(2):233–57.

Dasgupta, Partha. 1993. *An Inquiry into Well-Being and Destitution.* Oxford: Clarendon Press.

Datt, Guarav, and Martin Ravallion. 1997. "Why Have Some Indian States Done Better Than Others at Reducing Rural Poverty?" *Economica* 64.

———. 1998. "Farm Productivity and Rural Poverty in India." *The Journal of Development Studies* 34(4): 62–85.

Deininger, Klaus, and Lyn Squire. 1996. "A New Data Set Measuring Income Inequality." The World Bank Economic Review 10(3): 565–591. Data available at http://www.worldbank.org/html/prdmg/grwthweb/growth_t.htm.

Deininger, Klaus, and Lyn Squire. 1998. "New Ways of Looking at Old Issues: Inequality and Growth." *Journal of Development Economics* 57.

Easterly, William. 1997. "Life During Growth." Mimeo. World Bank Development Research Group.

Fields, Gary S. 1997. "Poverty, Inequality, and Economic Well-Being: African Economic Growth in Comparative Perspective." Mimeo (August). Prepared for presentation to the African Economic Research Consortium, Nairobi, Kenya.

Fogel, Robert. 1994. "Economic Growth, Population Theory, and Physiology: The Bearing of Long-Term Processes on the Making of Economic Policy." [Nobel Prize Lecture.] *American Economic Review* 84(3): 369–395.

Forbes, Kristin. 1997. "A Reassessment of the Relationship Between Inequality and Growth." Mimeo. Massachusetts Institute of Technology.

Gallup, John, Steven Radelet, and Andrew Warner. 1997. "Economic Growth and the Income of the Poor." Mimeo (August). Prepared for the Consulting Assistance on Economic Reform (CAER) II Project. Cambridge, MA: Harvard Institute for International Development (HIID).

Galor, O., and J. Zeira. 1993. "Income Distribution and Macroeconomics." *Review of Economic Studies* 60.

Knack, Stephen. 1999. "Social Capital, Growth, and Poverty: A Survey of the Cross-Country Evidence." Working Paper No. 7, World Bank, Social Capital Initiative.

Knack, Stephen, and Philip Keefer. 1997. "Does Inequality Harm Growth Only in Democracies? A Replication and Extension." *American Journal of Political Science* 41(1).

Kuznets, Simon. 1955. "Economic Growth and Income Inequality." *American Economic Review* 49(1): 1–28.

Larraín B., Felipe, and Rodrigo Vergara M. 1997. "Income Distribution, Investment, and Growth." Development Discussion Paper No. 596 (August). Cambridge, MA: Harvard Institute for International Development (HIID).

Larson, Donald, and Yair Mundlak. 1997. "On the Intersectoral Migration of Agricultural Labor." Economic Development and Cultural Change 45(2): 295–319.

Lewis, W. Arthur. 1954. "Economic Development with Unlimited Supplies of Labor." The Manchester School. Vol. 22, pp. 3–42.

Morduch, Jonathan. 1994. "Poverty and Vulnerability." *American Economic Review: Papers and Proceedings* 84(2): 221–5.

Narayan, Deepa, and Lant Pritchett. 1999. "Cents and Sociability: Household Income and Social Capital in Rural Tanzania." *Economic Development and Cultural Change* 57.

Perotti, Roberto. 1996. "Growth, Income Distribution, and Democracy: What the Data Say." *Journal of Economic Growth* 1(2): 149–88.

Piketty, Thomas. 1995. “Social Mobility and Redistributive Politics.” *The Quarterly Journal of Economics* 110(3).

Piketty, Thomas. 1998. “Theories of Persistent Inequality and Intergenerational Mobility.” Forthcoming. *The Handbook of Income Distribution*, edited by A. Atksinson and F. Bourgignon.

Ravallion, Martin. 1996. “Can High-Inequality Developing Countries Escape Absolute Poverty?” Mimeo. Policy Research Department, World Bank, Washington, D.C.

Ravallion, M., and Guarav Datt. 1996. “How Important to India’s Poor Is the Sectoral Composition of Economic Growth?” *The World Bank Economic Review* 10(1): 1–25.

———. 1999. “When is Growth Pro-Poor?” Mimeo. World Bank Development Research Group.

Ravallion, M., and Shaohua Chen. 1997. “What Can New Survey Data Tell Us about Recent Changes in Distribution and Poverty?” *The World Bank Economic Review* 11(2): 357–82.

Roemer, Michael, and Mary Kay Gugerty. 1997. “Does Economic Growth Reduce Poverty?” Consulting Assistance on Economic Reform (CAER) II Discussion Paper No. 4 (April). Cambridge: Harvard Institute for International Development (HIID), p. 42.

Summers, Robert, and Alan Heston. 1991 (updated 1996). “The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950–1988.” *Quarterly Journal of Economics* 106(2): 327–68.

Timmer, Ashley. 1998. “Exit Options and Political Stability.” Mimeo. Cambridge, MA: Harvard University Department of Economics.

Timmer, C. Peter. 1988. “The Agricultural Transformation.” In Volume 1 of the *Handbook of Development Economics*, edited by Hollis Chenery and T. N. Srinivasan. Amsterdam: North-Holland, pp. 275–331.

———. 1995. “Getting Agriculture Moving: Do Markets Provide the Right Signals?” *Food Policy* 20(5): 455–72.

———. 1996. “Agricultural Linkages to Economic Growth.” Mimeo. Prepared for the Agricultural Policy Analysis Project for the Africa Bureau of USAID. Cambridge, MA: Harvard Institute for International Development (HIID).

———. 1996a. “Food Security Strategies: The Asian Experience.” Prepared for a conference on food security in Central America sponsored by the Food and Agriculture Organization of the United Nations (September).

———. 1997. “How Well Do the Poor Connect to the Growth Process?” Mimeo. Cambridge, MA: Harvard Institute for International Development (HIID).

Warner, Andrew. 1999. "Growth and Inequality Once More; What Do the Data Finally Say?" Mimeo. Cambridge, MA: Center for International Development (CID), John F. Kennedy School of Government, Harvard University.

Woolcock, Michael. 1999. "Managing Risk, Shocks, and Opportunity in Developing Economies: The Role of Social Capital." Mimeo. World Bank Development Research Group.

World Bank. 1987. "World Development Report: Barriers to Adjustment and Growth in the World Economy." New York: Oxford University Press for the World Bank.

———. 1993. "The East Asian Miracle: Economic Growth and Public Policy." New York: Oxford University Press for the World Bank.

———. 1997. "World Development Report: The State in a Changing World." New York: Oxford University Press for the World Bank.

APPENDIX A

I. Definitions and the Data

Let Q^j_{it} stand for the income share of the j^{th} quintile in country i in year t. Let Y_{it} stand for GDP per person. And let N_{it} stand for total population. Total GDP of the first quintile is $Q_{it}*Y_{it}*N_{it}$. The population of the first quintile is $0.2*N_{it}$. Therefore, dividing total GDP by population we have GDP per person of the first quintile.

$$(1) \qquad Y^1_{it} = [\, Q^1_{it}/(0.2)\,]*Y_{it}$$

Here's an example of some typical numbers: in Australia in 1990, Y was \$14,445, Q^1 was 0.046 (4.6 percent), and Y^1 was \$3,322. Average GDP for the other four quintiles are of course calculated similarly.

Taking logs of both sides of equation 1 and letting lower-case letters stand for logs, we have

$$(2) \qquad y^1_{it} \;\ln(0.2) = y_{it} + q^1_{it.}$$

So far, there is no new information here. This equation is true just by virtue of the way the data are defined, plus some mathematics. But it helps us understand how to interpret the results when we run a regression with this data. Suppose we run a regression of (log) GDP of the first quintile on (log) total GDP, as in the following equation:

$$(3) \qquad y^1_{it} = \alpha_0 + \beta_1 * y_{it} + \mu_{it}$$

In this equation, α_0 is the intercept term, β_1 is the elasticity of connection of the poor to the overall economy, and μ is the error term. By comparing 2 and 3 , it is apparent that the error term (μ_{it}) in 3 and q^1_{it} in 2 will be closely related, and that the ln(0.2) term is going to be subsumed in the constant term. Essentially, the error term captures information in the data about income distribution. The next question is how do we interpret the OLS estimate in such a regression? We know from regression theory that the estimate of β_1 is going to be an estimate of the right-hand-side of the following expression:

$$(4) \quad p\lim \alpha_1 = 1 + [\, \mathrm{cov}\,(y_{it}, \mu_{it}) \,/\, \mathrm{var}\,(y_{it})\,]$$

The point here is to note that two questions are equivalent. Asking whether $\beta_1 = 1$ is the same as asking whether cov $(y_{it}, u_{it}) = 0$. Indeed, if cov $(y_{it}, u_{it}) = 0$, then the estimate of β_1 will be exactly 1, and equation 3 will look just like equation 2. The estimate of α_0 will be -ln(0.2), and the residuals from the regression will be the quintile income shares $\mu_{it} = q^1_{it}$. In this case the covariance above is equivalent to the covariance between GDP per capita and income distribution (measured by q^1_{it}).

In other words, if income distribution is not correlated with per capita GDP across countries and across time, then we would observe a covariance of zero and an estimated coefficient in the regression close to one. Therefore, regressions of the (log) level of GDP of the poor on the (log) level of GDP gives you in essence the same information as examining the correlation of income distribution and the level of GDP. For example, if income distribution improved as GDP rose, we would observe a positive covariance between q_{it} and $y_{it,}$ and the estimate of β_1 would be greater than one.

When dummy variables for countries or for time are added to the regression above, the same questions are being asked. The difference is that the variation in the data is restricted to either just time variation (when country dummies are in the regression) or just cross-sectional variation (when time dummies are in the regression). For example, Timmer (1997) estimates equation 3 with country dummies and decade dummies. He is therefore controlling for both decade-to-decade variation and all variation across countries. In effect, with this regression he is asking whether there is a correlation between GDP and income distribution over time within decades and within countries. Or put another way, for a given country and decade, is there correlation between GDP and income distribution?

II. Definitions of Growth and Differences in Specification

A. Growth Regressions versus Regressions in Levels

To calculate growth we take the difference in (log) GDP in two time periods and divide by the number of years between the two time periods. Doing this to equation 2 yields the following:

$$(5) \qquad (y^1_{it} - y^1_{it-T})/T = (y_{it} - y_{it-T})/T + (q^1_{it} - q^1_{it-T})/T$$

Since the "T" terms make no difference to the following discussion, we can write this more simply as:

$$(6) \qquad (y^1_{it} - y^1_{it-T}) = (y_{it} - y_{it-T}) + (q^1_{it} - q^1_{it-T})$$

This is analogous to equation 2 except that the data are in changes rather than levels. Just as in the regression with levels, if we run a regression of growth of the income of the poor on growth of the whole economy, the error term is again essentially measuring income distribution. If the change in income distribution is uncorrelated with growth, then the estimated coefficient on growth will be 1.0; if not, the estimated coefficient will be biased away from one. So looking at whether the coefficient in such a regression is one is the same thing as asking whether changes in inequality are correlated with changes in income (i.e., growth).

APPENDIX B

Table 1
Estimates of the Elasticity of Connection of the Poor
Using Growth Regression Framework

	Q1	Q2	Q3	Q4	Q5
Longest time span, full sample	.96 (.183)	.847 (.118)	.851 (.116)	.997 (.026)	1.04 (.030)
Longest time span, Timmer sample	1.2 (0.289)	.948 (.147)	1.13 (.118)	1.025 (.0811)	.9545 (.116)
Longest time span for years after 1964, full sample	.977 (.184)	.927 (.135)	.830 (.113)	1.00 (.041)	1.04 (.068)
Max number of intervals data permits, full sample	1.10 (.095)	1.09 (.069)	1.03 (.055)	1.07 (.054)	.90 (.050)
Max number of intervals data permits, Timmer sample	1.16 (.169)	1.029 (.148)	1.066 (.102)	.937 (.089)	.9917 (.092)
Max number of intervals, data after 1964, full sample	1.07 (.104)	1.09 (.075)	1.02 (.060)	1.077 (.060)	.900 (.055)
Intervals of at least 5 years, full sample	1.11 (.096)	1.10 (.070)	1.036 (.055)	1.07 (.055)	.892* (.051)
Intervals of at least 5 years, Timmer sample	1.18 (.172)	1.04 (.153)	1.08 (.106)	.943 (.093)	.977 (.095)
Intervals of at least 5 years, after 1964, full sample	1.082 (.105)	1.10 (.076)	1.033 (.061)	1.083 (.0611)	.8914 (.056)

The growth numbers reported here are calculated using log differences.

Table 2
Estimates of the Elasticity of Connection
Using Regressions in Levels

Sample Used	**Quintile 1**	**Quintile 2**	**Quintile 3**	**Quintile 4**	**Quintile 5**
Full sample, no decade dummies	0.979 *0.026*	0.99 *0.016*	1.02 *0.012*	1.02 *0.01*	0.99 *0.01*
Timmer sample, no decade dummies	0.951 *0.042*	1.02 *0.025*	1.04 *0.02*	1.00 *0.01*	0.99 *0.015*
Full sample, with decade dummies	0.934 *0.042*	0.99 *0.40*	1.02 *0.019*	1.03 *0.015*	0.98 *0.015*

Table 3
Results of Regressions Run in Levels and Growth for Different Measures of Inequality

	REGRESSIONS WITH INEQUALITY VARIABLE IN EQUATION		**REGRESSIONS RUN SEPARATELY**			
Regressions Run	**Coefficient on Inequality**		**Elasticity of Connection with Inequality = RELGAP**		**Elasticity of Connection with Inequality = Share of Q1**	
	Inequality = RELGAP	Inequality = share of q1	UNEQUAL	EQUAL	UNEQUAL	EQUAL
GROWTH REGRESSIONS:						
Full sample of countries	.892 (.784)	-36.27 (19.45)	.73 (.377)	1.18 (.097)**	.754 (.330)	1.18 (.103)
Timmer sample of countries	2.10 (1.27)	-62.70 (29.01)*	1.04 (.411)*	1.56 (.386)**	1.02 (.338)**	1.82 (.442)**
LEVELS REGRESSIONS:						
Full sample of countries	-.732 (.013)**	16.63 .167**	0.85 (0.08)**	1.016 (0.021)**	1.00 (.052)**	.998 (.021)**
Timmer sample of countries	-.679 (.020)**	18.47 (.277)**	.76 (.096)**	.1.027 (.030)**	.99 (.089)**	1.017 (.029)**

** Indicates significance at the 1% level, * at the 5% level.